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FERTILITY CONTROL AGENTS AS A POSSIBLE
SOLUTION TO THE WORLD
POPULATION PROBLEM

MELVIN M. KETCHEL*

The world is now facing a severe problem of human overpopulation because the birth rate has generally remained high while the death rate has been dramatically reduced. Plans to lower the birth rate have almost invariably centered upon the concept of family planning. It is the purpose of this paper to point out that even if family planning methods become widely used they may not necessarily lower the birth rate sufficiently to provide a solution to the population problem and that other methods can and probably will be developed which could solve the population problem without relying on family planning. The use of such methods will raise moral and political questions of great importance, however, and it is my hope that this essay will provide a basis upon which a discussion of these issues can begin. Such a discussion would prepare us for making decisions concerning the implementation of these methods when they become available and may, if sufficient support for their use emerges, encourage the development of such methods.

Family Planning as a Solution to the Population Problem

The pioneers in the family planning movement were primarily concerned with aiding families. When the natural fertility of the parents resulted in too many children for the family's welfare, family planning methods were provided to prevent unwanted pregnancies. Somewhat later the family planning movement was strengthened by the inclusion of many people whose major interest was in solving the population problem by lowering the birth rate. It was reasoned that, as more and more couples

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learned the techniques of limiting the size of their families, they would do so, and eventually a large percentage of the world's population would practice family planning with the result that the reduction in the number of children born to them would significantly lower the world's birth rate. No other acceptable means of solving the population problem have been available, and even partial success of the family planning approach has been of value.

Some hope has been provided by history that family planning methods might eventually dramatically lower the world's birth rate. The term "demographic revolution" has been applied to the transition of a population with a high death rate and a high birth rate to a population with a low death rate and a low birth rate. It appears that the reduction in the infant death rate which occurs as a country becomes developed makes it unnecessary for each couple to have many babies in order to raise children to maturity, that children become an economic liability rather than an economic asset, and that the aspirations of people to provide more education and other advantages for their children encourages them to have fewer children on which to concentrate their efforts. These factors, plus many others, lead to the development of the "small family ideal." The decision to have fewer children is implemented primarily by the utilization of contraceptive techniques. A demographic revolution occurred in Europe and North America following the Industrial Revolution, and in Japan following World War II, and people concerned about the growth rate of the population of the rest of the world hope that the dramatic world-wide reduction in the death rate during the past twenty-five years is the first step in a demographic revolution that will result in a rapid reduction in the world's birth rate.

Whether the conditions under which a demographic revolution can complete itself now exist in the underdeveloped countries of the world is a matter of considerable controversy. Up to the present, demographic revolutions have occurred only when a gradually declining death rate was accompanied by considerable economic and social development. It may be that the levels of education, living standard, and motivation required if family planning is to be successful cannot be attained in underdeveloped countries precisely because their high birth rates prevent the necessary economic development. On the other hand, the demographic revolution which occurred in Europe and North America took place essentially with-

out governmental or organizational influence, whereas at present strong organizations and some governments are working strenuously to lower birth rates. How successful these efforts will be is of course a matter of conjecture, but it cannot be assumed that the demographic revolution will complete itself in the absence of considerable economic development, and it seems unlikely that the necessary economic development will occur without a decrease in the birth rate.

Even if we assume that a demographic revolution is taking place, we must also question how rapidly it will progress. The absolute numbers of people produced during a gradual reduction of the annual growth rate may provoke catastrophic upheavals as the essentials of life become increasingly scarce. Some reliable experts now believe that widespread famine will occur in the underdeveloped countries within ten years [1, 2]. Of course the growth and effectiveness of the family planning movement should, like the growth of populations, be exponential, and we should be optimistic about the future of family planning. But a look at the most recent ten-year period for which data are available shows that the death rate is falling more rapidly than the birth rate, so that the annual rate of growth of the world's population is increasing. We simply do not know how rapidly the people in countries with high birth rates will accept family planning, but the slow rate at which such acceptance has occurred in the past by no means excludes the possibility that overpopulation will become overwhelming before the birth rate can be significantly lowered.

Family planning has already lowered the world's birth rate to some extent, and undoubtedly further effort will improve the results. How much improvement is required if family planning is to solve the population problem? To solve it permanently, of course, the birth rate must be lowered to the level of the death rate, for the exponential nature of the growth curve dictates that, if births exceed deaths by any amount, astronomical numbers of people will eventually be produced. For practical purposes, however, we probably ought to be satisfied if the birth rate can be lowered enough to alleviate the problems caused by overpopulation during the next three or four generations. It would be difficult to obtain agreement among experts on how much the birth rate should be lowered, but one might ask how much the birth rate would have to be lowered if the world's population were to double only once during the next 100 years, or about four generations. The present annual growth rate of the

world's population of about 1.7 per cent would then have to be reduced to about 0.7 per cent. In large parts of the world, particularly those in which the introduction of family planning is proving most difficult, the average annual growth rate now exceeds 2 per cent. The only major area of the world in which the annual growth rate is below 1 per cent is Europe.

What would be required to bring the annual growth rate of the rest of the world to below 1 per cent? Assuming that there will be no further drastic changes in the death rate, we would have to reduce the birth rate by about one-third. While at present this could not be done without family planning techniques, we must realize that even if family planning were used by everyone, the birth rate might not be sufficiently reduced. Enough people may simply choose to have large families to keep the growth rate above 1 per cent. While it is obvious that family planning can reduce only the number of unwanted children, it seems to me that discussions of family planning in relation to the population problem always have implicit in them the assumption that if we could only get enough people to use family planning techniques the population problem would be solved. This assumption cannot be accepted until we know how many children people will wish to have when they achieve the ability to regulate the numbers.

How many children could each family have if the annual growth rate is not to exceed 0.7 per cent? It is not possible to translate an annual growth rate directly into an average number of children per family, but if certain assumptions are made, a rough approximation may be calculated. For example, suppose that the average generation time, or average age of parents when their children are born, is twenty years and that all children born reach reproductive age. The average generation time varies widely and would probably be higher than twenty years in some cultures and lower in others. While all children born do not reach reproductive age, the numbers who do not are small enough to be neglected in these rough calculations. Let us assume further that 10 per cent of the couples in the population are infertile and that another 10 per cent of the population does not marry. Most estimates of infertility put the number of infertile couples at about 10 per cent, but many of these people are treatable, and probably this number could be reduced. The number of people who do not marry would probably be more than 10 per cent in some populations and less in others. Using these admittedly hypothetical conditions, a zero growth rate

could be maintained if each fertile couple had an average of 2.5 children. If each fertile couple had three children, the annual growth rate would be slightly less than 1 per cent, and the population would double every eighty years. An average of 3.5 children per fertile couple would reduce the doubling time of the population to thirty-nine years. In any population in which 80 per cent of the people born marry and have children at a young age, family planning would have to reduce the average number of births to considerably less than three per family if the population were to double only once every 100 years. But an average of one-half child more or less per fertile couple makes the difference between an acceptable growth rate and a growth rate of serious consequences.

We do not have adequate information to predict how many children the average couple will want when family planning is available to everyone. It may well be less than three in some cultures, but it may also be more than three in others. In general, we have assumed that as the standard of living, educational level, and motivation of a population are increased—conditions under which family planning would be most successful—the desire of couples for large families will be decreased. But will it be decreased enough? While no statistics are available, many readers will share with me the impression that there were large numbers of couples in the United States who graduated from college and married in the years following World War II, and who used family planning methods but still had large families. Is it not possible that, even when they can easily control the size of their families, the desire for children will lead people to have more children than the earth can support?

Thus, while it is obvious that the family planning movement has been of tremendous value to the people who have used it, has lowered the birth rate when it is used, and will become increasingly valuable as the movement expands, it seems to me that the following statements should be accepted as possibilities. *The reduction in the world's death rate may not, in fact, indicate that a world-wide demographic revolution will continue to completion. If a demographic revolution is occurring, it may proceed so slowly that the increases in population which occur before its completion may be so large that they cannot be supported. And even if the demographic revolution does complete itself rapidly, the desire for children in the world's population may still be strong enough to produce an annual growth rate which will soon result in overwhelming numbers of people.*

Fertility Control Agents

The great interest in recent years in the study of the physiology of reproduction and in methods of contraception makes it appear to me very likely that in a relatively few years efficient methods by which the fertility of populations can be reduced without dependence upon the practice of contraception by individual couples will become available.

For the purpose of discussion, let us suppose that a compound has become available which, when administered in small doses, has no significant physiological effect except to raise the threshold requirement of some substance involved in the implantation of blastocysts. This would mean that while some blastocysts would implant in women given the compound, a percentage of blastocysts which would otherwise have implanted would not now do so. Let us further suppose that the dosage of this compound could be varied so that the reduction in the birth rate could be established at from 5 to 75 per cent less than the present birth rate. Although many problems would remain even if such an ideal compound could be found, the use of such a compound would enable a government to control the rate of growth of its population without depending upon the voluntary action of individual couples. Although a number of colleagues with whom I have discussed this differ with me in speculation about when such compounds will be developed, I believe such compounds should be available for field testing in a relatively short time, perhaps five to fifteen years.

I differentiate, then, between two methods of reducing the birth rate. One is the family planning method in which participation is voluntary. The other, which I have designated "fertility control" measures, would be carried out by governments to lower the fertility of their populations without requiring action by individual couples. Thus, part of a population may be using family planning techniques, but all of the population would be affected by fertility control measures.

Effects of Fertility Control Measures

One of the principal requirements for a contraceptive method, if it is to be useful in the family planning approach to population control, is that it be virtually 100 per cent effective. In contrast, any method developed for fertility control must not have 100 per cent effectiveness, or the population would stop having births. What would be required, then, is a method which is capable of reducing the births to any desired level.

The nature of the curve which would be obtained if a survey were made of the fertility¹ of couples in a population is unknown, since the data have not been collected. I have drawn curve *A* in Figure 1 as my guess as to the nature of that curve, without designating absolute units. The curve for fertility of a population would probably resemble a normal distribution curve, except that, since some couples are infertile, the curve would not become asymptotic at the left. If a compound such as the one I have hypothesized were administered to a population, it might act by slightly reducing the fertility of each couple in the population, so that there would be a shift to a lower average fertility, as shown by curve *B*. Perhaps there

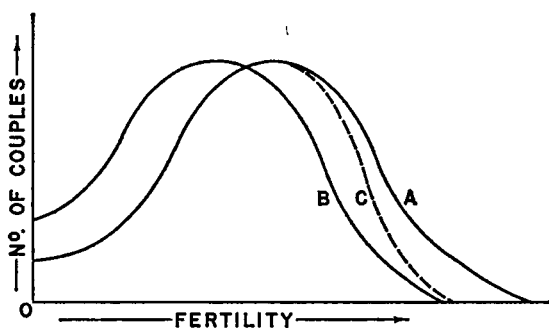


FIG. 1.—Curve *A*: probable shape of the distribution curve for fertility within a population. No data are available. It would be expected that the curve would be similar to a normal distribution curve, except that, since there are a number of infertile couples in the population, the curve does not become asymptotic at the left. Curve *B*: the effect of fertility control measure which decreased the fertility of all couples in the population to an equal degree. Curve *C*: the effect of a fertility control agent which reduced the fertility of the most fertile couples in the population.

would be advantages if such a compound had the effect of selectively reducing the fertility of the most fertile couples in the population, an effect represented by curve *C*. Other possibilities exist, however, which would have to be guarded against as such agents were developed and tested. For example, some agents might selectively lower the fertility of those whose fertility is already among the lowest in the population, so that the number of infertile couples would be increased without affecting the fertility of the most fertile couples. Such an agent would deprive people of relatively low fertility of having any children at all and would not be satisfactory. Another possible effect of such a compound which would probably make it

¹ "Fertility" is used here to represent the relative capability to reproduce, not the amount of reproduction which actually occurs.

unusable is that, because of inherent variability from couple to couple of the factor affected by the agent, some couples would become completely infertile while the fertility of other couples would be unaffected. I believe that the goal in the development of fertility control agents should be to reduce the fertility of everyone equally.

It should be strongly emphasized that, although fertility control agents would be used to cause a reduction of the fertility of the population as a whole, there would still be considerable freedom of action for individual couples. Family planning methods could still be used for the purpose of limiting and spacing children within the family. Well-motivated people could probably circumvent the action of any fertility control measures that could be developed by acting to increase their chances of establishing a pregnancy, much as many couples of low fertility do at present. If too many couples circumvented the action of the fertility control agent, it would no longer be useful. However, the necessity of taking positive action would probably make such circumvention relatively unimportant.

Fertility control agents such as the hypothetical one I described would have no effect in reducing the number of unwanted children, legitimate or illegitimate, except insofar as they reduce the fertility of the population as a whole. One can, however, visualize a fertility control agent which would render everyone infertile until its action was reversed by an act of the individuals involved. Such a method might require an individual to take a pill to become pregnant, rather than to take a pill to prevent pregnancy, and would virtually eliminate the serious problem of unwanted children.

Some Requirements for a Satisfactory Fertility Control Agent

In order to be usable, a fertility control agent would need to have the following characteristics: (1) It should lend itself to being easily and unobtrusively included in the intake of everyone in the population; requiring people to receive injections, to take the agent themselves, or to submit to direct physical treatment would be unsatisfactory. In highly organized urban areas an agent might be included in the water supply, but other methods would be required in less developed areas and in areas with low population density. (2) It must be harmless. There must be no danger to the health of anyone receiving it, or to the development of fetuses or children. (3) It should be inexpensive. (4) Its effect should be easily reversible. The agent should disappear and have to be replaced fairly rapidly

so that, if the fertility of the population becomes too low, there would not be too great a time lag between cessation of administration and cessation of its effect on the fertility of the population. (5) It should not interfere with the family planning activities of individual couples. (6) It should not act by affecting in any way the sexual activity of the individuals in the population.

Fertility Control as a Function of Government

A primary question involved in the decision to use fertility control agents is whether the control of the rate of growth of its population is a proper function of government. A recurrent theme in science fiction is the plight of couples who wish to have children but are forbidden by their government (or its computer) from doing so. Governmental intervention in the lives of individuals is often characterized either by an inflexibility which neglects individual circumstances or by a flexibility which permits discrimination and injustice. Ingle, in a discussion of the ethics of governmental intervention in reproduction, concludes that such matters should not be undertaken by governments [3]. In 1967, U Thant, secretary-general of the United Nations, issued an important statement signed by thirty heads of state in which the decision to have as many children as one desires is called a "basic human right" [4]. Yet the rate of growth of the population profoundly affects the lives of all individuals within the population as well as the members of future generations. No couple may reasonably maintain that the number of children born within the family is strictly a family matter, for the quality of life of every individual in the population is changed simply by the increase in the number of people competing for the necessities of life. Few people would now maintain that the control of air pollution is outside the responsibility of government, and I would argue that allowing population growth to go unchecked is at least as serious a hazard to the welfare of people as the exhaust from automobiles and factories.

Governments already can and do influence fertility rates, although at the present time their ability to do so is primitive, and therefore the degree of control is probably small. However, governmental support or prevention of family planning activities may make it easier or more difficult for people to practice family planning. Propaganda is often used by governments to encourage people to have children. Such governmental action as giving financial rewards to couples with large numbers of children, providing

housing allotments for families, giving income tax deductions for dependents, and establishing child care centers for the children of working mothers may not have as their primary purpose the encouragement of people to have children, but such actions probably tend to raise the birth rate to some degree by relieving people of some of the financial burden associated with parenthood. Traditionally, most governments, when they have acted at all, have acted to encourage a higher birth rate, but more recently some countries have made it governmental policy to encourage family planning in order to reduce the birth rate.

The function of the government in regulating the rate of growth of its population should be clearly differentiated from governmental involvement in decisions concerning who may and who may not reproduce. It would be possible for a government using fertility control agents to reduce statistically the birth rate of the population without making decisions concerning individuals, and therefore strict impartiality could be maintained. However, there would probably be great pressures exerted on the government to couple the use of fertility control agents with programs aimed at preventing reproduction among people considered "unfit" for parenthood or among geographic, racial, economic, or political groups. Such proposals would undoubtedly be made in the name of "positive eugenics." The role of government in a eugenics program should be argued on its own merits, however, because it poses a threat to individual liberty that is not involved in a program to lower statistically the birth rate of the whole population by a method that would affect everyone equally.

I believe that the question of whether the control of the rate of growth of its population is a proper function of government ultimately comes down to the question of whether it is necessary. If the rate of growth of the population presents no serious problems, the government ought not to intrude in this matter. But if the growth rate of the population is seriously affecting the welfare of the population, as a rapid growth rate surely does, and the growth rate cannot be lowered by any voluntary means, then it is, I believe, a necessary and proper function of the government to take action to slow the rate of growth.

Possible Alternatives to Fertility Control Agents

If the control of the rate of growth of its population is a proper function of government, then a decision must be made concerning how to exercise

that control. Obviously, the method of choice would be the one which is capable of accomplishing the objective of lowering the birth rate but which least interferes with the lives of the people.

It seems obvious that any government contemplating the use of involuntary methods of fertility control should lower its birth rate as much as possible by supporting family planning programs. If it becomes necessary to prevent some people from having children they want, it would be ridiculous not to try to prevent the births of children that were not specifically wanted. Also, the more the birth rate was lowered by voluntary means, the less the population would have to be affected by the use of involuntary means.

Aside from family planning programs, how can governments lower birth rates? The suggestion has often been made that there be a reversal of economic policies which encourage people to have large families. For example, dependency allowances on income taxes might be eliminated or changed to tax surcharges for each child over a specified number. Direct financial allotments to large families could be stopped. Free or inexpensive child care centers could be eliminated. Such proposals must be judged as alternatives to fertility control agents on two counts. First, how effective they would be, and second, whether they would be more onerous than fertility control agents.

Financial pressures against large families would probably be effective only in developed countries in which there are large numbers of middle-class people. In underdeveloped countries practically no financial inducements to have children now exist to be reversed, and the imposition of further taxes upon the many poor people would depress their living standards even further and probably only succeed in raising the death rates. In developed countries people in higher economic groups could still afford to have as many children as they wished, so the economic pinch associated with having children would be felt mainly by middle-class and lower-middle-class people, to whom the cost of having children, though somewhat eased by government economic favors, is still relatively high. In order to be effective, economic pressures would probably have to be severe enough to be quite painful, and when they reached a level of painfulness at which they were effective, they would probably seriously affect the welfare of the children who were born in spite of the pressures. It seems to me that the same arguments apply to the use of economic pressures to

lower the birth rate as are used to argue against the issue of suppressing illegitimacy by cutting off aid to dependent children. If children become a financial burden, there will be fewer of them, but those that are born will be punished by being deprived of precisely those economic advantages they should have, both for humanitarian reasons and for their growth and development into worthwhile citizens. The same objection applies to the use of financial rewards to induce people not to have children because such programs would make the families with children the poorer families. A further objection to the use of economic pressures or rewards is that, since they would be primarily effective against certain economic groups, such methods are discriminatory.

Since there is a substantial decrease in fertility among couples as they advance in age, a delay in the age of marriage has been proposed as a means of reducing the size of families. To be effective in keeping the average family size between two and three children, the average age of marriage would probably have to be advanced by a sizable number of years. The age at which people marry is largely determined by slowly changing cultural and economic factors, however, and could probably be changed quickly in a population only by rather drastic measures. How might this be done? One can visualize raising substantially the legal age of marriage, but an inordinately severe punishment for violators would be required. Denying housing or other requirements for married life to people below a certain age could also be used to prevent marriages. But neither of these alternatives seems attractive to me when compared to a situation in which people are allowed to marry at an age consistent with their cultural and biological desires and to have their families while they are young, and in which there is no other interference with their marriages except that the number of children they will have is reduced statistically by a fertility control agent.

A policy of allowing couples to have only a certain number of children would, of course, be effective in solving the population problem, but any conceivable way in which this could be done would, I think, be more objectionable than the use of fertility control agents. Statutory regulations of family size would be unenforceable unless the punishment for exceeding the limit was so harsh that it would cause harm to the lives of the existing children and their parents. Such possible procedures as vasectomizing the father or implanting long-acting contraceptives in the mother would re-

quire a direct physical assault by a government agent on the body of an individual that, in my opinion, would be worse to contemplate than fertility control agents. It may be argued that philosophically there is little difference between the direct physical assault of sterilization and the remote physical assault of administering a fertility control agent, but in practical terms there is obviously a great difference.

I think that, once family planning has been exploited to the degree that it can be to reduce births, further reduction, if necessary, could be accomplished only by a choice of unpleasant methods. It is my opinion that fertility control agents would be less objectionable than other solutions that can be visualized at this time.

Moral Aspects of Fertility Control Agents

Surely the most controversial aspects of fertility control agents would be the moral issues. Is it possible to justify the affront to human dignity and privacy of forcing people to take a drug which they do not want but which may be necessary for the welfare of the society? I believe that justification for the use of fertility control agents comes from an analysis of what will happen if they are not used.

If voluntary methods of population control are not sufficiently effective, then we must either impose some involuntary method of fertility control or accept the consequences of excessive population. I attempted earlier in this paper to show that any workable involuntary methods would be more objectionable and would probably require a greater infringement on human liberty than fertility control agents. If my analysis is correct, then, we may ultimately be forced to make a moral choice between fertility control agents and excessive numbers of people.

During the 1950's, discussions of the population problem often included projections of exponential growth curves which showed that the world's population would eventually become ridiculously large. One of my favorites was a projection which calculated that, if population growth were not curbed, at some future time the layer of human protoplasm which would by then be covering the surface of the earth would be expanding at the speed of light. Such dramatic projections made the problem seem so remote, however, that many people felt that population problems were really no concern of the present generation and that the relatively few children more or less that the present generation had would not be a prob-

lem. Also, such unrealistic projections invited speculation in a similar vein for dealing with the problem. For example, many people suggested that our excess population could be shipped off to other planets. More recently, when discussions have centered about problems of feeding and caring for the people that are projected for the near future, unrealistic projections of technological advances were still suggested as solutions to the problem. Farming of the sea and desert, greater utilization of farm land, and mass culture of microorganisms were proposed as solutions to the problem of feeding large numbers of people. Let the population grow, people seemed to think, somehow they will be taken care of, and we might as well have as many children as we want because what difference would our few children make in the millions that will be born.

It now appears, however, that the race between technological advances and population growth is favoring population growth and that starvation will be a major problem in the world in about ten years [1, 2]. Most food surpluses in the world have been used up, and there is no indication that food production can be increased quickly enough to prevent this starvation. Laissez faire will apparently solve the population problem, therefore, simply by raising the death rate, through starvation and malnutrition, to the level of the birth rate. Large numbers of births will still occur, but so many people will die that there will be no increase in the world population until technological improvements produce a larger food supply. There seems little that can be done now to prevent starvation for millions of people in the next decade, but if we had been able to curb population growth in the last decade, this suffering probably would not be in prospect.

Massive hunger in the world, then, seems to be one alternative to reducing the birth rate. If the reduction of the birth rate requires the use of fertility control agents by governments, then the moral justification for their use must certainly be in the prevention of the agony of hunger and slow death for millions of people and a miserable level of existence for millions of others.

A laissez faire attitude toward population growth presents another prospect which seems to me to be equal in seriousness to the starvation that will occur. Unless some new technological approach to fertility control is utilized, a solution to its problem of overpopulation would require a massive effort on the part of the government of an underdeveloped country which such governments may be unable or unwilling to undertake. It

would probably be far easier for a large underdeveloped country to develop a nuclear capability than it would to solve its population problem. As more and more countries acquire nuclear capability, their attempts to obtain the essentials of life may cause catastrophic upheavals in the world which will result in even greater danger and suffering than the starvation itself.

The moral question, then, resolves itself for me into a choice of alternatives. A laissez faire attitude is unthinkable because of the amount of suffering that will result. Voluntary methods are to be preferred if they will work, but if they do not, then involuntary methods must be used. Fertility control agents would seem to be the most effective and least objectionable of any methods that can be visualized.

Political Aspects of Fertility Control Agents

If a perfected fertility control agent were available now, I am certain that it would not be utilized in any democratic country, for no population would be likely to vote to have such agents used on itself. This means that the effects of overpopulation are not yet acute enough for people to accept an unpleasant alternative. It seems ironic to me that, when the problems of overpopulation do become acute enough to make people willing to accept fertility control, it will only be after subjecting many individuals to great suffering which need never have occurred.

Thus, any attempt to lessen by fertility control agents the problems that will eventually occur as a result of overpopulation requires an analysis of the distastefulness of fertility control agents. The understanding gained from such an analysis would be useful in implementing governmental action.

One level of resistance to the acceptance of fertility control agents would probably be psychological. The benefits of fluorides in alleviating dental disease seem clearly to be worth the risk involved in its use, yet the acceptance of fluoride treatment of public water supplies has met extreme political resistance. Even though a primary requirement of any fertility control agent would obviously be that it have no significant effect on any physiological function other than fertility, I am sure that public resistance to fertility control agents would be far greater than the resistance to fluoride. Also, I have been surprised at the number of sophisticated and educated people who mention "saltpeter" when I suggest the possibility of

using fertility control agents. They were obviously confusing the control of fertility with the control of sexual activity.

Fertility control agents will ultimately become politically acceptable when they become politically necessary. If population growth continues, people will probably be willing to accept fertility control agents as the lesser of evils. It will help people to accept them, however, if they are informed of the degree to which starvation, poverty, and other problems which ensue are related to overpopulation.

Summary and Discussion

The rate at which humans can reproduce is an evolutionary vestige remaining from an era in human history in which large numbers of offspring were required for the survival of the species, and probably includes a substantial safety factor of reproductive potential as well. The full reproductive potential of the human is probably not expressed because a variety of social, cultural, economic, and biological forces have tended to limit childbirth. These limiting forces tend to evolve very slowly, but over a sufficient period of time they can be effective in adjusting the birth rate of the population to any change in circumstances. Thus, as the death rate was gradually reduced in Europe and North America following the Industrial Revolution, a reduction in the birth rate gradually followed.

Modern technology has recently had a dramatic effect in reducing the death rate throughout the world, and it now appears that the forces which can lower the birth rate will not evolve rapidly enough to prevent widespread overpopulation and an eventual re-establishment of a high death rate. What would be required to prevent this is another significant technological advance, one which will dramatically increase the ability of the world to support the population, or one which will limit the number of people being born.

We should be actively seeking a technological advance which will increase the number of people that the earth can support, for such an advance will help us to cope with the numbers of people who will be born despite any humane action that can now be taken. However, even if such an advance were made, it could only act as a palliative because ultimately a reduction in the birth rate must occur. It is possible, however, that a technological advance which would increase greatly the food supply

would provide the necessary time for the further evolution of forces which would decrease the birth rate.

Meanwhile, we should be actively seeking a revolutionary breakthrough in methodology for reducing the birth rate. Improvements in the technology of contraception, though helpful, may not suffice, because the birth rate would still depend upon how many children people wanted rather than how many were required to stabilize the growth of the population. What is required is a method which would allow a population to control its rate of growth. I have suggested that fertility control agents would provide a practical solution to the problem. I have also attempted to show that the advantages of using fertility control agents would more than offset the considerable objections to them.

It seems clear that no single, simplistic solution to the population problem is available. Family planning has already had an effect in reducing the birth rate of the world, and our goal should be to extend its use as rapidly as is possible to the point that the only children born are those that are specifically wanted. Improved methods of contraception are important, but ways of motivating people to use them must be developed further. Food production must immediately be increased as much as is humanly possible to prevent the suffering and starvation that will inevitably occur in the next decade. But I believe we should also begin to develop and test fertility control agents seriously, to develop methods of introducing them into the intake of populations, and to arrive at a consensus which will dictate whether such agents will be utilized when they are developed.

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